SA100

Office of Research Services
Proposals/Contracts & Grants
Colorado School of Mines
Golden, CO 80401-1887
303/273-3405

COLORADO SCHOOL OF MINES
GOLDEN, COLORADO 80401-1887

0000063354

May 26, 1995

Wendy Bartholomew, Subcontract Administrator II
Environmental Services
EG&G Rocky Flats, Inc.
P.O. Box 464
Golden, Colorado 80402-0464

RE: RFP - Task Order MTS 353044-019NM3 - WLB-188-95

Dear Ms. Bartholomew:

Enclosed please find one original and two copies of CSM Proposal No. 4579 entitled ***"Passive Leachate Collection and Treatment System in Operable Unit (OU) No. 7,"*** submitted in response to the above mentioned RFP by Drs. Robert Siegrist and Linda Figueroa.

If you have any questions or require further information, please contact me at (303) 273-3411. Thank you.

Sincerely,

Sharon L. Dehmlow

Sharon L. Dehmlow
Program Assistant

BZ-A-000396

1/22

RESEARCH PROPOSAL

In Response to RFP for Task Order MTS 353044-019NM3 - WEB-188-95

Submitted to:

EG&G Rocky Flats, Inc.
Rocky Flats Plant, Building 131
Procurement Department
P.O. Box 464
Golden, Colorado 80402-0464

Submitted by:

Environmental Institute of Rocky Flats
Colorado School of Mines
Golden, Colorado 80401

Title:

PASSIVE LEACHATE COLLECTION AND TREATMENT SYSTEM IN OPERABLE UNIT (OU) NO. 7

CSM Proposal No. 4579

Proposed Starting Date: June1, 1995
Proposed Duration: 24 months
Amount Requested: $367,229

Principal Investigator:
Robert L. Siegrist, Research Associate Professor
Division of Environmental Science
and Engineering
Phone: (303) 273-3490

Division Director:
John A. Cordes, Professor
Division of Environmental Science
and Engineering
Phone: (303) 273-3427

Institute Director:
John O. Golden, Professor
Environmental Institute at Rocky Flats
Phone: (303) 273-3255

Administrative Official
Arthur J. Kidnay, Dean of Graduate
Studies and Research
Phone: (303) 273-3427

May 1995

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PASSIVE LEACHATE COLLECTION AND TREATMENT SYSTEM IN OPERABLE UNIT (OU) NO. 7

Principal Investigator:
Robert L. Siegrist, Ph.D., P.E.
Research Associate Professor
Environmental Science and Engineering Division
Colorado School of Mines

1.0 Introduction and Background

Operable Unit No. 7 at the Rocky Flats Environmental Technology Site (RFETS) is comprised of the Present Landfill (IHSS 114), the Inactive Hazardous Waste Storage Area (IHSS 203), and the East Landfill Pond and adjacent spray evaporation areas, including IHSS's 167.2 and 167.3 (1-3). A Phase I facility investigation/remedial investigation (RFI/RI) was conducted at OU 7 in 1992-93. Prior to completion of the Phase I RFI/RI, it was decided to adopt a presumptive remedy strategy for streamlined site characterization and remediation. As designated by EPA, source containment is the presumptive remedy for municipal landfills. The containment presumptive remedy includes the following components: institutional controls, a landfill cap, landfill gas control, source area ground water control, and leachate collection and treatment. As a result of this action, two interim measure/interim remedial actions (IM/IRA's) were required for OU-7. The first included an IM/IRA for collection and treatment of the landfill leachate at the seep above the East Landfill Pond, and another IM/IRA for closure of the Present Landfill.

The landfill leachate currently seeps out of the eastern toe of the landfill and enters the East Landfill Pond. Based on limited monitoring, the composition of the OU-7 seepage appears reasonably typical of industrial waste landfill leachate (Tables 1 and 2). The flow rate varies from approximately 1 to 7 gallons per minute (gpm) with the peak flows occurring during the higher precipitation months in the spring. The pH is near neutral and the solution is anoxic. There are high concentrations of organic carbon and suspended and dissolved solids, including magnesium, calcium, iron, and chlorides. The seepage contains concentrations of contaminants that exceed potentially applicable, relevant, and appropriate requirements (ARARs) including chlorinated solvents (e.g., tetrachloroethene, 1,2-dichloroethene, vinyl chloride) and heavy metals (e.g., cobalt and zinc). Radioactivity in the seepage is below background levels. Based on its source and composition, the leachate is classified as an F039 listed waste.

The objective of the leachate collection IM/IRA is to stop discharge and limit downgradient migration of leachate from the source area thus minimizing exposure of receptors to contaminated leachate. During discussions with the Colorado Department of Public Health and the Environment (CDPHE) and the Environmental Protection Agency (EPA) during fall 1994, the IM/IRA was negotiated as a Proposed Action Memorandum (PAM). The leachate collection and treatment system proposed at that time consisted of a sump to collect the leachate seeping out of the toe of the landfill. This seepage was then to be pumped to holding tanks up on the hillside and periodically trucked to the OU-1/OU-2 treatment facility for processing and disposal.

During May 1995, further consideration of the above approach revealed the costs to be prohibitively high and in addition the system was not compatible with the final remedy under consideration. As a result, DOE is investigating a passive system as an interim action for collection and treatment of the leachate. DOE proposed to modify the PAM to make the interim action more cost effective and compatible with the final remedy, and CDPHE and EPA agreed with this approach. As a result of these actions, a project was conceived as described herein, to design, implement, and evaluate passive treatment systems for the leachate from OU-7.

↳ Treatability Study?

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2.0 Objectives and Scope

The goal of the proposed work is demonstrate a feasible and cost-effective method of passive treatment for the leachate that is currently seeping from the eastern toe of the landfill in OU-7 to both reduce the interim flux of contaminants into the East Landfill Pond, and provide operation and performance data needed to design and implement the final closure for OU-7. To achieve this goal, the proposed project involves a field demonstration wherein a seepage collection and treatment system will be installed and then optional passive methods for treatment of the seepage from OU-7 will be tested and evaluated. The system will be designed and implemented to reduce the flux of potential contaminants of concern from OU-7 to and below likely ARARs prior to discharge into the East Landfill Pond. While accomplishing this objective, the system will also enable optional passive methods to be tested and evaluated. Thus, while reducing the overall flux of contaminants during the interim period prior to final closure of OU-7 (an estimated period of operation of 18 months), the demonstration will also provide important technical information in support of the overall closure of OU-7. The information derived from this demonstration will also be of value for application to other OU's at RFETS.

Again, beginning to sound like a Feasibility Study

3.0 Technical Approach

As currently envisioned, a demonstration facility would be established in an area encompassing ~1000 ft^2 at the eastern toe of the landfill within OU-7. The installation would require limited excavation for placement of the components at grade both to facilitate gravity flow through the system for treatment prior to discharge to the East Landfill Pond as well as to provide protection from the weather. The demonstration facility would be intentionally rather simple and not rely on outside power or other utilities. It would consist of an interception system, a siphon dosing system, a series of three or four small basins (each ~500 to 1000 gal in size), associated piping, and various monitoring/measurement devices. The interception system would consist of a lined, rock-filled gallery that would capture the current seepage from the landfill and deliver it under gravity and without aeration into an adjacent siphon chamber. The siphon system would enable intermittent dosing of the passive reactors (either in parallel or series based on piping configurations); this dosing is desired as it helps create uniform flow and batch treatment within the passive treatment units. Within each of the three or four basins, a passive treatment unit would be inserted and connected into the seepage flow piping. Each unit would support a different passive treatment process. Based on a preliminary review of the flow rate and composition of the seepage, and the performance goals for the demonstration, three different processes are currently envisioned including biosorption, chemo-oxidation, and bimetallic reduction (5-8). It is worth noting however, that the system installed at OU-7 would permit testing and evaluation of other processes as well.

why do we not know this? Should this technology be proven and singular.

To accomplish the project objectives, the following principal work elements are planned: (1) project planning and control, including preparation and maintenance of schedule and budget documents and participation during overall OU-7 project team meetings; (2) conceptual and detailed design of an interceptor system and passive treatment reactor housing system to be procured and installed by others; (3) conceptual design of three optional passive treatment methods (e.g., biosorption, chemo-oxidation, and bimetallic reduction); (4) laboratory experiments as needed to gather site specific operation and performance data for three optional passive treatment methods; (5) interaction and inspection during installation of the interceptor system and reactor housing at OU-7; (6) fabrication and installation of the passive reactors in the facilities at OU-7; (7) shakedown and startup of the passive treatment system; (8) performance monitoring and operational refinements as needed; (9) data analysis and interpretation; and (10) report preparation. These work elements are broken down into tasks as indicated in Table 3. As described in the following section, the preceding work elements would

Oh I don't think so Mr. Sigrist!

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be completed by faculty and students at CSM and colleagues at Oak Ridge National Laboratory (ORNL) under the direction of the principal investigator and in close coordination with the DOE OU-7 Manager and the Contractor Technical Representative.

4.0 Organization and Staffing

The proposed project will be directed by Dr. Robert L. Siegrist, the principal investigator for the work. Dr. Robert Siegrist is a Research Associate Professor in the Environmental Science & Engineering Division at CSM. Dr. Siegrist holds B.S. (High Honors, 1972), M.S. (1975), and Ph.D. (1986) degrees in Environmental Engineering from the University of Wisconsin at Madison. He has over 20 years experience in environmental engineering including research and practice in diverse areas of environmental restoration and waste management and has directed numerous inter-disciplinary and multi-institutional field scale demonstrations in the U.S. and abroad. His work has addressed diverse areas including site characterization and risk assessment, alternative treatment processes, and passive and in situ remediation technologies. Prior to joining CSM, Dr. Siegrist was Group Leader for Environmental Engineering at Oak Ridge National Laboratory where he was responsible for ten research staff and an annual budget in excess of $2 million devoted to applied research and development in areas directly related to the proposed project. Dr. Siegrist has been actively involved in DOE funded technology development projects for five years and currently holds a Q-clearance. He retains a joint appointment with ORNL as a Research Staff Member on a part-time basis.

Important contributions to the project will also be made by Dr. Linda Figueroa, an Assistant Professor at CSM who has experience in biosorption processes. The proposed work will also benefit from graduate student involvement and contribute to their education and advancement.

An extremely important component of the CSM team will be collaborating scientists and engineers affiliated with Oak Ridge National Laboratory (ORNL) in Grand Junction, Colorado. The linkage with ORNL is extremely valuable to the proposed effort as it facilitates leveraging the proposed project with recent and ongoing DOE technology development work that has encompassed passive treatment methods envisioned for study in this project (e.g., biosorption, chemical oxidation, and bimetallic zero valence metal reduction).

In completion of the proposed project, the DOE OU-7 Manager and the RFETS Contractor Technical Representative will be routinely communicated with. Moreover, these staff as well as other members of the OU-7 project team will be actively involved in related components of the project and critical to the success of the demonstration. The following services are envisioned to be provided by them: (1) guidance and oversight on the CSM project activities; (2) OU-7 project management and integrated work control package management for RFETS; (3) revision of the PAM to reflect the Passive Leachate Collection and Treatment System, (4) preparation and execution of a procurement package to install the interception system and the passive treatment reactor housings, (5) acquisition of necessary permits and approvals for conduct of the work at RFETS (e.g., excavation and soil disturbance permits), (6) supervision and construction oversight during installation of the interception system and reactor housings, and (7) collection, analysis, and validation of selected performance evaluation data. The latter work is important to generate the requisite operation and performance data to satisfy CDPHE and EPA regulatory requirements. In parallel with and addition to this data, the CSM team will monitor and measure system operation and performance including the collection and analysis of raw and treated seepage and passive system media.

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5.0 Schedule and Deliverables

The schedule and deliverables envisioned for the proposed project are outlined in Table 3. The project duration is proposed to cover a total of 24 months, beginning on June 1, 1995. This period is believed appropriate to permit rigorous testing and evaluation of the optional treatment methods under variable leachate flow rates and composition, during different seasons of the year.

6.0 Budget

The budget for the proposed work is outlined in the attached budget documentation. The project costs are comprised of labor for faculty and students at CSM and collaborators from ORNL. In addition there are costs for travel, materials and supplies, and fabrication of the passive treatment units and associated measurement devices for field testing.

7.0 References

1. OU7 Final Work Plan Technical Memorandum. Rocky Flats Environmental Technology Site, Golden, Colorado. RF/ER-94-00044. October 5, 1994.
2. Proposed Action Memorandum: Seep Collection and Treatment Operable Unit 7 Present Landfill (IHSS 114) and Inactive Hazardous Waste Storage Area (IHSS 203) Final Report. EG&G Rocky Flats, RF/ER-95-0059.UN. December 1994.
3. Technical Specifications: Seep Collection and Storage Facility Operable Unit No. 7. Rocky Flats Environmental Technology Site, Golden, Colorado. RF/ER-94-00044. December 1994.
4. Request for Proposal - Task Order MTS 353044-019NM3 - WLB-188-95. EG&G Rocky Flats, Golden, Colorado. May 18, 1995.
5. Gates, D.D. and R.L. Siegrist. 1995. In Situ Chemical Oxidation of Trichloroethylene Using Hydrogen Peroxide. *J. Environmental Engineering*. (In press).
6. Morris, M.I. , R.L. Siegrist, and D.T. Davenport. 1994. Environmental Technology Demonstrations at U.S. DOE Facilities: Observations Regarding the Current Process and Methods for Improvement. Proc. Symp. Waste Management '94. Mar. 1994. Tucson, AZ. U.S. Department of Energy.
7. Korte, N.E., R.L. Siegrist, and P.M. Kearl. 1994. In Situ Treatment of Mixed Contaminants by Process Modules Coupled with Groundwater Recirculation Systems. Proc. Emerging Technologies in Hazardous Waste Management VI. September 19-21, 1994, Atlanta, American Chemical Society.
8. Liang, L., B. Gu, R.L. Siegrist, and J.D. Goodlaxson. 1994. Removal of Heavy Metals from Groundwater by Peat Materials. Proc. Emerging Technologies in Hazardous Waste Management VI. September 19-21, 1994, Atlanta, American Chemical Society.

Table 1. General water quality characteristics of the OU-7 leachate seepage (4). [a]

Contaminant	Units	Potential ARAR	Number of Samples	Number that exceed ARARs	Min.	Max.	Mean
pH	-	-	5	-	6.8	7.3	7
Alkalinity	mg$CaCO_3$/L	-	15	-	554	705	596
Dissolved solids	mg/L	-	15	-	470	670	729
Suspended solids	mg/L	-	12	-	10	250	145
TOC	mg/L	-	3	-	19.0	24.5	20.8
DOC	mg/L	-	4	-	14.0	27.0	16.8
Oil and grease	mg/L	-	4	-	0.8	42.1	7.0
Calcium	mg/L	-	18	-	126	212	153
Magnesium	mg/L	-	18	-	29.3	49.0	34.7
Potassium	mg/L	-	18	-	5.0	11.7	8.6
Iron	mg/L	-	18	-	61.3	155.0	81.0
Manganese	mg/L	-	18	-	2.49	2.490	1.623
Chloride	mg/L	250	14	0	1.8	66.3	53.6
Sulfate	mg/L	-	14	5	0.2	29.6	5.1
Phosphorus	mg-P/L	-	9	-	0.1	1.4	0.4
Nitrate/nitrite	mg-S/L	10	10	0	<0.02	0.87	0.26

[a] Based on grab samples collected from the seepage on 1 to 3 sampling dates from February 1990 through March 1993.

Table 2. Potential contaminants of concern in the OU-7 leachate seepage (4). [a]

Contaminant	Units	ARAR	Number of Samples	Number that exceed ARARs	Minimum	Maximum	Mean
Cobalt	ug/L	10	18	2	2.7	19.1	12
Manganese	ug/L	200	18	18	1320	2490	1623
Zinc	ug/L	2000	18	16	957	16000	2974
Gross Beta	pCi/L	8	6	6	3.8	17	10
2-methylnaphthalene	ug/L	10	5	5	12	23	16
Naphthalene	ug/L	10	5	5	14	22	16
1,1-Dichloroethane	ug/L	1	20	17	2	10	6
1,2-Dichloroethene	ug/L	1	20	10	2	14	4
Benzene	ug/L	1	20	4	1	2	2
Chloroethane	ug/L	5	20	15	10	57	22
Methylene Chloride	ug/L	4.7	20	5	3	190	13
Tetrachloroethylene	ug/L	1	20	0	1	1	1
Vinyl Acetate	ug/L	5	19	1	10	49	5
Vinyl Chloride	ug/L	2	20	5	3	11	5

[a] Based on grab samples collected from the seepage on 1 to 3 sampling dates from February 1990 through March 1993.

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Table 3. Schedule and deliverables for the proposed project.

Task	Description	Performance period [a]	Deliverable and date
1.	Project planning and management, including schedule and cost control, and OU-7 team meetings and interactions	June 1, 1995 to May 31, 1997	Monthly progress reports
2.	Conceptual design development for the passive treatment system and optional treatment methods after review of OU-7 seep characterization data and performance requirements	June 1, 1995 to June 15, 1995	Preliminary conceptual design on June 2, 1995 and a final conceptual design on June 15, 1995
3.	Detailed design for augmenting if needed and inclusion in the procurement package	June 1, 1995 to July 10, 1995	Detailed design information by July 10, 1995
4.	Intermittent inspection and interaction during procurement and installation of interception and treatment cell demonstration facility	To be determined based on construction	None required
5.	Laboratory experiments as needed to develop site specific operation and performance data for three passive treatment processes	July 1995 through May 1996	None required
6.	Fabrication and installation of passive treatment units and monitoring/ measurement devices at the demonstration site (phased for units 1, 2, and 3)	August 1995 to March 1995	One unit on line by September 30, 1995 and remaining two units on line no later than March 31, 1996
7.	Shakedown and startup of the passive treatment system(s) (phased for units 1, 2, and 3)	During 14 days following installation	None required
8.	Performance monitoring and operational refinements	Continuous during period of operation	None required
9.	Data analysis, interpretation and reporting	Continuos during project period	None required
10.	Reports	Intermittently throughout project period	Monthly progress updates Progress report on September 15, 1996 Draft final report on May 15, 1997

[a] The proposed period dates are based upon contract award by EG&G to CSM on or before June 1, 1995.

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CONTRACT PRICING PROPOSAL COVER SHEET

1. SOLICITATION/CONTACT/MODIFICATION NO.: RFP - Task Order MTS 353044-01CNM3-WLB-188-63

FORM APPROVED OMB NO. 9000-0013

NOTE: This form is used in contract actions if submission of cost or pricing data is required. (See FAR 15.804-6(b))

2. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)
Colorado School of Mines
1500 Illinois Street
Golden, Colorado 80401

DUNS No. 01-082-8170

3A. NAME AND TITLE OF OFFEROR'S POINT OF CONTACT
Robert Siegrist (technical)
Mary Mittag-Miller (contract)

3B. TELEPHONE NO.
(303) 273-3490
(303) 273-3405

4. TYPE OF CONTRACT (Check)
- [ ] FFP
- [ ] CPFF
- [ ] CPIF
- [ ] CPAF
- [ ] FPI
- [X] OTHER (Specify) Cost Reimbursable

4. TYPE OF CONTRACT ACTION (Check)
- [X] A. NEW CONTRACT
- [ ] B. LETTER CONTRACT
- [ ] C. CHANGE ORDER
- [ ] D. UNPRICED OTHER
- [ ] E. PRICE REVISION / REDETERMINATION
- [ ] F. OTHER (Specify)

5. PROPOSED COST (A + B = C)

A. COST	B. PROFIT/FEE	C. TOTAL
$367,229	$0	$367,229

6. PLACE(S) AND PERIOD(S) OF PERFORMANCE
Environmental Institute at Rocky Flats; 6/1/95-5/31/97.

7. Net and reference the identification, quantity and total price proposed for each subject line item. A line item cost breakdown supporting this recap is required unless otherwise specified by the Contracting Officer. (Continue on reverse, and then on plain paper, if necessary. Use same headings.)

A. LINE ITEM NO.	B. IDENTIFICATION	C. QUANTITY	D. TOTAL PRICE	E. REF.
	Passive Leachate Collection and Treatment System in Operable Unit (OU) No. 7			
	FY 95		$47,417	
	FY 96		231,921	
	FY 97		87,891	
	TOTAL		$367,229	

8. PROVIDE NAME, ADDRESS, AND TELEPHONE NUMBER FOR THE FOLLOWING (If available)

A. CONTRACT ADMINISTRATION OFFICE
Colorado School of Mines
Office of Research Services
1500 Illinois St. ATTN: Mary Mittag-Miller
Golden, CO 80401 (303) 273-3405

B. AUDIT OFFICE
Defense Contract Audit Agency (DCAA)
Denver Branch Office
7112 W. Jefferson Ave., Suite 200
Lakewood, CO 80235-2327 (303) 969-5000

9. WILL YOU REQUIRE THE USE OF ANY GOVERNMENT PROPERTY IN THE PERFORMANCE OF THIS WORK? (If "Yes," identify)
- [ ] YES
- [X] NO

10A. DO YOU REQUIRE GOVERNMENT CONTRACT FINANCING TO PERFORM THIS PROPOSED CONTRACT? (If "Yes," complete Item 10B.)
- [ ] YES
- [X] NO

10B. TYPE OF FINANCING (check one)
- [ ] ADVANCE PAYMENTS
- [ ] GUARANTEED LOANS
- [ ] PROGRESS PAYMENTS

11. HAVE YOU BEEN AWARDED ANY CONTRACTS OR SUBCONTRACTS FOR THE SAME OR SIMILAR ITEMS WITHIN THE PAST 3 YEARS? (If "Yes," identify item(s), customer(s), and contract number(s))
- [ ] YES
- [X] NO

12. IS THIS PROPOSAL CONSISTENT WITH YOUR ESTABLISHED ESTIMATING AND ACCOUNTING PRACTICES AND PROCEDURES AND FAR PART 31 COST PRINCIPLES? (If "No," explain)
- [X] YES
- [ ] NO

13. COST ACCOUNTING STANDARDS BOARD (CASB) (Public Law 91-379 as amended and FAR PART 30)

13A. WILL THIS CONTRACT ACTION BE SUBJECT TO CASB REGULATIONS? (If "No," explain in proposal)
- [ ] YES
- [X] NO OMB Circular A-21

13B. HAVE YOU SUBMITTED A CASB DISCLOSURE STATEMENT (CASB DS-1 OR 7)? (If "Yes," specify in proposal the office to which submitted and if determined to be adequate)
- [ ] YES
- [X] NO

13C. HAVE YOU BEEN NOTIFIED THAT YOU ARE OR MAY BE IN NON-COMPLIANCE WITH YOUR DISCLOSURE STATEMENT OR COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)
- [ ] YES
- [X] NO

13D. IS ANY ASPECT OF THIS PROPOSAL INCONSISTENT WITH YOUR DISCLOSED PRACTICES OR APPLICABLE COST ACCOUNTING STANDARDS? (If "Yes," explain in proposal)
- [ ] YES
- [X] NO

This proposal is submitted in response to the RFP, contract, modification, etc. in Item 1 and reflects our best estimates and/or actual costs as of this date and conforms with the instructions in FAR 15-804-6(b) (2), Table 15-2. By submitting this proposal, the offeror, if selected for negotiation, grants the contracting officer or an authorized representative the right to examine, at any time before award, those books, records, documents and other types of factual information, regardless of form or whether such information is specifically referenced or included in the proposal as the basis for pricing, that will permit an adequate evaluation of the proposed price.

15. NAME AND TITLE (Type)
Sharon L. Dehmlow, Program Assistant

16. NAME OF FIRM
Colorado School of Mines

17. SIGNATURE
Sharon L. Dehmlow

18. DATE OF SUBMISSION
5/26/95

NSN 7540-01-152-8045

1411-102

STANDARD FORM 1411 (7-97)
Prescribed by GSA
FAR (48 CFR) 53.215-2(c)

PROPOSED BUDGET
June 1, 1995 - May 31, 1997

	FY 1995 6/1/95-9/30/95	FY 1996 10/1/95-9/30/96	FY 1997 10/1/96-5/31/97	Total
A. SALARIES AND WAGES				
1. Robert Siegrist - PI, 173.3 hrs. in FY 95; 520 hr. in FY 96; 347 hrs. in FY 97 ($73.37/hr. in FY 95 & 96; $77.04 in FY 97)	$12,715	$38,152	$26,733	$77,600
2. Linda Figueroa - Co-PI, 147 hrs. in FY 96; 126 hrs. in FY 97 ($64.42/hr. in FY 96; $67.64/hr. in FY 97)	0	9,470	8,523	17,993
3. Graduate Research Assistants:				
a. 1 Ph.D. student - 558 hrs. in FY 95; 1,349 hrs. in FY 96; 718 hrs. in FY 97 ($15.79/hr. in FY's 95 & 96; $16.58 in FY 97)	8,811	21,301	11,904	42,016
b. 1 M.S. student - 1,349 hrs. in FY 96; 721 hrs. in FY 97 ($14.91/hr. FY 96; $15.66/hr. FY 97)	0	20,114	11,291	31,405
4. Technician - 69 hrs. in FY 95; 416 hrs. in FY 96; 132 hrs. in FY 97 ($32.02/hr. in FY's 95 & 96; $33.62/hr. in FY 97)	2,209	13,320	4,438	19,967
5. Undergraduate student help hourly - 257 hrs. in in ea. of FY's 96 and 97, @ $10.64/hr.	0	2,734	2,734	5,468
Subtotal	$23,735	$105,091	$65,623	$194,449
B. OTHER DIRECT COSTS				
1. Misc. laboratory supplies	$1,000	$2,500	$500	$4,000
2. Photocopying, telephone	250	750	250	1,250
3. Instrumentation consumables	500	1,500	1,000	3,000
4. Travel	500	1,000	1,500	3,000
5. Photography	100	300	300	700
6. Subcontract - Oak Ridge Nat'l. Lab	7,500	75,000	10,000	92,500
7. Safety PPE	250	500	250	1,000
8. Waste disposal	50	100	100	250
Subtotal	$10,150	$81,650	$13,900	$105,700
C. MODIFIED TOTAL DIRECT COSTS	$33,885	$186,741	$79,523	$300,149
D. OTHER DIRECT COSTS - II				
1. Permanent Equipment - Apparatus:*	$5,000	$10,000	$0	$15,000
a. 3 Reactors with packing	1,500	3,500	0	5,000
b. Connection fittings and piping	1,250	1,000	500	2,750
c. M/M sensors and datalogging				

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2. GRA Tuition, fees & health insurance:				
a. 1 student, resident status, entire period	504	9,061	2,920	12,485
b. 1 student, resident status, FY's 96 & 97 only	0	9,061	2,920	11,981
Subtotal	$8,254	$32,622	$6,340	$47,216
B. TOTAL DIRECT COSTS	$42,139	$219,363	$85,863	$347,365
F. INDIRECT COSTS (52% of B excluding subcontract costs exceeding $25,000)	5,278	12,558	2,028	19,864
C. TOTAL PROJECT COST	$47,417	$231,921	$87,891	$367,229

*The interception and reactor tank infrastructure is excluded from this cost estimate, as are costs for onsite contractor support, equipment time, all permits, etc.

CALCULATIONS FOR BUDGET

Indirect Cost Rate - 52%

Fringe Benefits

AY Faculty - 23.5%
Research Faculty, 12-month contract faculty - 28.5%
Classified Staff (technicians, etc.) - 21.7%

Siegrist: Monthly salary is $6,200. A 5% increase has been added on. Breakdown into an hourly wage is as follows: $6,200x1.05/173.3 = $37.56. A fully burdened rate would be $37.56 x 1.285 x 1.52 = $73.37.

Figueroa: Academic year salary (8.5 mos.) is $48,146. A 5% increase has been added on. Breakdown into hourly wage is as follows: $48,146x1.05/8.5/173.3 = $34.32. A fully burdened rate would be $32.68 x 1.235 x 1.52 = $64.42.

Graduate Students: Monthly salary is $1,700 for Masters students and $1,800 for Ph.D. students. Breakdown into an hourly wage is as follows: $1,700/173.3 = $9.81; $1,800/173.3 = $10.39. A fully burdened rate would be $9.81 x 1.52 = $14.91; $10.39 x 1.52 = $15.79.

Undergraduate Students: Hourly rate is $7. A fully burdened rate would be $7 x 1.52 = $10.64.

Technician: The monthly salary is $3,000. Breakdown into an hourly rate is as follows: $3,000/173.3 = $17.31. A fully burdened rate would be $17.31 x 1.217 x 1.52 = $32.02.

COLORADO SCHOOL OF MINES
TENURE-TRACK ACADEMIC FACULTY EMPLOYMENT CONTRACT

THIS TENURE-TRACK ACADEMIC FACULTY EMPLOYMENT CONTRACT, hereinafter the "Contract," is entered into on the 1st day of August, 1994, between Colorado School of Mines, hereinafter "CSM," and Linda A. Figueroa hereinafter the "Employee."

IN CONSIDERATION of the agreements, conditions and covenants hereinafter set forth, CSM and the Employee hereby agree as follows:

1. Position. CSM hereby employs the Employee in the position of Assistant Professor of Environmental Science and Engineering at CSM.

2. Term. The term of this Contract shall commence on August 22, 1994, and unless terminated sooner by either party, continue in effect until the date of spring commencement in May of 1998, at which time it shall expire. Neither party shall be required to provide notice of expiration or nonrenewal to the other.

3. Academic Tenure. This Contract does not confer academic tenure or any right to a specific term of employment upon the Employee. However, this appointment is tenure-track and will enable the Employee to apply for tenure review upon successful completion of applicable Handbook requirements.

4. Renewal. This Contract shall automatically and without necessity of notice be renewed for succeeding academic years unless one of the following specific actions has occurred:

a. The Employee has tendered a resignation which has been accepted by the President or Board of Trustees of CSM;
b. The Employee has retired from CSM pursuant to the procedure set forth in the Handbook;
c. CSM has terminated this Contract pursuant to the procedure set forth in the Handbook; or
d. This Contract has expired on the date set forth in paragraph 2. above.

5. Renewal Procedure. To increase administrative efficiency, this Contract shall not be reissued annually by CSM. Commencing in 1995, CSM shall annually notify the Employee of his or her salary for the upcoming year in writing at an appropriate time. CSM reserves the right to supersede this Contract with a new form contract at any time. If one or more significant characteristics of the Employee's employment undergoes a major change, CSM may issue a more appropriate form contract to the Employee in the future.

6. Incorporation of Faculty Handbook. All provisions, terms and conditions of the eleventh edition of the CSM Faculty Handbook which are applicable to academic faculty members, hereinafter referred to as the "Handbook," shall, unless provisions of this Contract specifically contravene, be incorporated by this reference as if fully set forth herein. Any subsequent editions of the Handbook duly ratified by the Board of Trustees shall be considered valid amendments to this Contract.

7. Salary. The initial annual salary to be paid to the Employee hereunder shall be forty eight thousand one hundred forty six and no/100 dollars ($48,146.00), payable in twelve (12) equal monthly installments from account no. 2-40489 commencing with the month of September and ending with the month of August. CSM shall make such deductions from each monthly installment as are required or may be required by CSM or by law, as well as such other deductions as may be requested by the Employee in writing.

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8. Duties. The Employee shall perform duties commonly performed by persons of comparable position or rank in colleges or universities of like size and with similar standing and mission, as well as other reasonable duties required by CSM. Such duties shall be performed by the Employee during the period specified in paragraph 9. below.

9. Period of Performance. Unless the Employee is required to perform summer services pursuant to paragraph 11. below, the period of time each year covered by this Contract shall commence on the date of the fall faculty conference at the beginning of the academic year and end on the date of spring commencement at the conclusion of the academic year.

10. Employee Effort. The employment created hereunder shall be considered to be full-time and shall require a percentage of effort on the part of the Employee equivalent to one hundred percent of a full-time position. The Employee shall devote the entire time specified herein to the performance of this Contract and shall refrain from engaging in additional professional work unless written permission is first obtained from CSM to engage in such outside activity or enterprise.

11. Summer Services. CSM may require the Employee to render professional services in field courses or summer school during the summer following each academic year. Notice of the requirement to render summer services and the remuneration therefor shall be given to the Employee by CSM on or before April 1st of each year, otherwise this requirement shall be null and void for that year.

12. State Fiscal Limitation. Financial obligations of the State of Colorado payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted and otherwise made available. Therefore, appointment to this position is expressly contingent upon adequate moneys being appropriated by the state legislature to fund this position.

13. Entire Agreement. This Contract contains the entire agreement between CSM and the Employee on the subject of the Employee's employment by CSM and shall supersede any and all prior written or oral agreements or representations between the parties hereto on the above-mentioned subject.

EMPLOYEE

Linda A. Figueroa
Employee

7-31-94
Date

[redacted]
Social Security Number

COLORADO SCHOOL OF MINES

President, Colorado School of Mines, on behalf of the Trustees of Colorado School of Mines

8/29/94
Date

Assistant State Controller

8/25/94
Date

COLORADO SCHOOL OF MINES
SPONSORED PROGRAM EMPLOYMENT CONTRACT
SALARIED APPOINTMENT

THIS SPONSORED PROGRAM EMPLOYMENT CONTRACT, hereinafter the "Contract," is entered into on the 6th day of December 1994, between Colorado School of Mines, hereinafter "CSM," and Robert Siegrist, S.S.N. [redacted] hereinafter the "Employee."

IN CONSIDERATION of the agreements, conditions and covenants hereinafter set forth, CSM and the Employee hereby agree as follows:

1. Position. CSM hereby employs the Employee in the position of Research Associate Professor in the Environmental Science and Engineering Division at CSM.

2. Term. The term of this Contract shall commence on 1 January 1995, and unless terminated sooner by either party, continue in effect until 15 June 1995, at which time it shall expire. Neither party shall be required to provide notice of expiration to the other party.

3. Legal Nature of Employment Relationship. Pursuant to Section 24-19-104 (1993) of the Colorado Revised Statutes, the employment relationship created hereunder shall be deemed to be employment-at-will. This paragraph shall constitute formal notice of nonrenewal of any previous employment contract which has been issued to the Employee by CSM.

4. Termination. This Contract may be terminated in writing by either party at any time for any reason. In the event CSM terminates this Contract for cause, the review procedures set forth in the eleventh edition of the CSM Faculty Handbook, hereinafter the "Handbook," covering dismissal of nontenured academic faculty members for cause shall apply.

5. Advance Notice of Termination or Nonrenewal. In accordance with the principle of employment-at-will, neither party shall be required to provide advance notice of termination or nonrenewal to the other.

6. Academic Tenure. This Contract does not confer academic tenure upon the Employee. Moreover, this appointment is not tenure-track and will not enable the Employee to apply for tenure review based upon services rendered hereunder.

7. Incorporation of Faculty Handbook. All provisions, terms and conditions of the Handbook which are applicable to nontenured academic faculty members shall, unless provisions of this Contract specifically contravene, be incorporated by this reference as if fully set forth herein. Any subsequent editions of the Handbook duly ratified by the Board of Trustees shall be considered valid amendments to this Contract.

8. Salary. The salary to be paid to the Employee hereunder shall be Thirty-Four Thousand, One Hundred and no/100 dollars ($34,100.00), payable in monthly installments of $5,200.00, pro-rated for partial months, from account no(s). [redacted] commencing with the month of January 1995 and ending with the month of June 1995. CSM shall make such deductions from each monthly installment as are required or may be required by CSM or by law, as well as such other deductions as may be requested by the Employee in writing. If other appropriate funding sources become available in the future, CSM may, in its sole discretion, change the account(s) listed above from which the Employee shall be paid.

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9. Duties. The Employee shall perform the duties specified by the research grant or contract which funds the Employee's position, as well as other reasonable duties required by CSM.

10. Employee Effort. The employment created hereunder shall require a percentage of effort on the part of the Employee equivalent to 100 percent of a full-time position.

11. Insurance Benefits. If the percentage of effort required by the Employee's position, as set forth in paragraph 10. above, is equal to or greater than fifty percent, the Employee shall be covered by CSM's employee insurance benefit package. If the percentage of effort is less than fifty percent, the Employee shall not be covered by CSM's employee insurance benefit package.

12. Leave Benefits. The Employee shall accrue annual and sick leave at the rate specified in the Handbook in proportion to the percentage of effort required by the Employee's position, as set forth in paragraph 10. above.

13. Post-Termination Remuneration. No compensation, whether as a buy-out of the remaining term of the Contract, as liquidated damages, or as any other form of remuneration, shall be owed or paid to the Employee upon or after termination of the Contract, except for compensation earned prior to termination and prorated to the date of termination.

14. State Fiscal Limitation. Financial obligations of the State of Colorado payable after the current fiscal year are contingent upon funds for that purpose being appropriated, budgeted and otherwise made available. Therefore, appointment to this position is expressly contingent upon adequate moneys being appropriated by the state legislature to fund this position.

15. Entire Agreement. This Contract contains the entire agreement between CSM and the Employee on the subject of the Employee's employment by CSM and shall supersede any and all prior written or oral agreements or representations between the parties hereto on the above-mentioned subject.

EMPLOYEE

Employee

12-12-94
Date

[redacted]
Social Security Number

COLORADO SCHOOL OF MINES

President, Colorado School of Mines, on behalf of the Trustees of Colorado School of Mines

12/12/94
Date

Assistant State Controller

12-12-94
Date

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COLORADO SCHOOL OF MINES

STANDARD GRA PACKAGE FOR
ACADEMIC YEAR 1994-95

Arthur J. Kidnay
Dean of Graduate Studies & Research

DATE: 18 August 1994

The standard Graduate Research Assistant package applicable for Academic Year 1994-95 consists of the following rates and associated benefits.

Minimum stipend rate M.Sc. candidates:	$ 800.00/month for 20 hours/week academic year (8/22/94-5/5/95)		
	$1600.00/month for 40 hours/week summer term (5/8/95-8/18/95)		
Minimum stipend rate Ph.D. candidates:	$850.00/month for 20 hours/week academic year (8/22/94-5/5/95)		
	$1700.00/month for 40 hours/week summer term (5/8/95-8/18/95)		
Full payment of tuition per semester:	Fall/Spr.:	Resident:	$2,091.00
		Nonresident:	$6,195.00
	Summer:	Resident:	$ 420.00
		Nonresident:	$1,239.00
Full payment of fees per semester:	Fall/Spr.:	$207.00	
	Summer:	$ 83.50	
Full payment of health insurance/semester: If insurance has been provided during Spring semester, the coverage will carry through Summer term. The Summer rate applies to students not covered previously during the Spring semester.	Fall/Spr.:	$420.00	
	Summer:	$147.00	

The above rates represent minimum stipend amounts. In accordance with specific departmental policies or with the discretion of the individual principal investigators, the stipend rates may be increased.

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PROPOSED FRINGE BENEFIT RATE
FISCAL YEAR 95-96

	RESEARCH FACULTY	NON-RESEARCH FACULTY	CLASSIFIED STAFF
PERA 11.6%	11.60%	11.60%	11.60%
MEDICARE	0.68%	0.68%	0.68%
CLASSIFIED INSURANCE	0.00%	0.00%	6.83%
FACULTY INSURANCE	8.16%	8.16%	0.00%
RETIREE'S INSURANCE	0.22%	0.22%	0.00%
UNEMPLOYMENT	0.16%	0.16%	0.16%
WORKMENS COMP	1.41%	1.41%	1.41%
ANNUAL/SICK LEAVE	6.27%	1.27%	1.27%
	28.50%	23.50%	21.70%

DEPARTMENT OF THE NAVY
OFFICE OF NAVAL RESEARCH
800 NORTH QUINCY STREET
ARLINGTON, VA 22217-5660

IN REPLY REFER TO

PROVISIONAL RATE AGREEMENT

INSTITUTION: COLORADO SCHOOL OF MINES
GOLDEN, COLORADO 80401

The indirect cost rates contained herein are for use on grants, contracts and/or other agreements issued or awarded to the Colorado School of Mines by all Federal Agencies of the United States of America, in accordance with the cost principles mandated by the Office of Management and Budget (OMB) Circular A-21 and in accordance with OMB Circular A-88. These provisional rates shall be used for forward pricing and billing purposes for the Colorado School of Mines' Fiscal Year 1995 or until amended. This rate agreement supersedes all previous rate agreements or determinations for Fiscal Year 1995.

SECTION I: RATES - TYPE: PROVISIONAL (PROV)

Type	Effective Period From	To	Rate	Base	Applicable To	Location
Prov	7-1-94	Until Amended	52%	(a)	Organized Research (1)	On Campus
Prov	7-1-94	Until Amended	27%	(a)	Organized Research (1)	Off Campus
Prov	7-1-94	Until Amended	57%	(a)	Organized Research (2)	On Campus
Prov	7-1-94	Until Amended	33%	(a)	Organized Research (2)	Off Campus
Prov	7-1-94	Until Amended	62%	(a)	Instruction (1)/(2)	All
Prov	7-1-94	Until Amended	23%	(a)	Other Sponsored Activities (1)/(2)	All

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DISTRIBUTION BASE:

(a) Modified Total Direct Cost (MTDC), as defined in OMB Circular A-21, consisting of salaries and wages, fringe benefits, materials and supplies, services, travel and subgrants and subcontracts up to the first $25,000 each.

APPLICABLE TO

(1) Applies to DoD contracts awarded before November 30, 1993, all Non-DoD Instruments, and all DoD Grants.

(2) Applies to only DoD contracts awarded on or after November 30, 1993 in accordance with and under the authority of DFARS 231.303(1). See Section II, Part D hereof.

SECTION II - GENERAL TERMS AND CONDITIONS

A. LIMITATIONS: Use of the rates set forth under Section I is subject to any statutory or administrative limitations and is applicable to a given grant, contract or other agreement only to the extent that funds are available and consistent with any and all limitations of cost clauses or provisions, if any, contained therein. Acceptance of the rates agreed to herein is predicated upon all the following conditions: (1) that no costs other than those incurred by the grantee/contractor were included in the indirect cost pool as finally accepted and that all such costs are legal obligations of the grantee/contractor and allowable under governing cost principles; (2) that the same costs that have been treated as indirect costs are not claimed as direct costs; (3) that similar types of costs have been accorded consistent accounting treatment; and (4) that the information provided by the contractor/grantee, which was used as the basis for the acceptance of the rates agreed to herein and expressly relied upon by the Government in negotiating and accepting the said rates, is not subsequently found to be materially incomplete or inaccurate.

B. ACCOUNTING CHANGES: The provisional rates contained in Section I of this agreement are based on the accounting system in effect at the time this agreement was negotiated. Changes to the method(s) of accounting for costs which affects the amount of reimbursement resulting from the use of these rates require the written approval of the authorized representative of the cognizant negotiating agency for the Government prior to

implementation of any such changes. Such changes include but are not limited to changes in the charging of a particular type of cost from indirect to direct. Failure to obtain such approval may result in subsequent cost disallowances.

C. USE BY OTHER FEDERAL AGENCIES: The rates set forth in Section I hereof were negotiated in accordance with and under the authority set forth in OMB Circular A-88. Accordingly, such rates shall be applied to the extent provided in such circular to grants and contracts to which OMB Circular A-21 is applicable, subject to any limitations in part A of this section. Copies of this document may be provided by either party to other Federal agencies which have or intend to issue or award grants and contracts using these rates or to otherwise provide such agencies with documentary notice of this agreement and its terms and conditions.

D. APPLICATION OF INDIRECT COST RATES TO DoD CONTRACTS/SUBCONTRACTS:

1. In accordance with DFARS 231.303, no limitation (unless waived by the institution) may be placed on the reimbursement of otherwise allowable indirect costs incurred by an institution of higher education under a DOD contract awarded on or after November 30, 1993, unless the same limitation is applied uniformally to all other organizations performing similar work. It has been determined by the Department of Defense that such limitation is not being uniformally applied. Accordingly, the rates cited (2) of Section I, as explained under the title "APPLICABLE TO" (2), do not reflect the application of the 26% limitation on administrative indirect costs imposed by OMB Circular A-21 where as (1) does so.

2. Signature of this agreement by the authorized representatives of the Colorado School of Mines and the Government, acknowledges and affirms the University's request for waiver of the prohibition contained in DFARS 231.303(1) and the Government's exercise of its discretion under DFARS 231.303(2) to waive the prohibition in DFARS 231.303(1) for the indirect cost rate applicable only to sponsored instruction. The waiver request by the Colorado School of Mines is made to simplify the University's overall management of DoD cost reimbursements under any DoD contracts for this function only.

E. SPECIAL REMARKS:

1. The elements of indirect cost and the base or bases used in computing billing rates shall not be construed as determinative of the indirect costs to be distributed or of the

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bases of distribution to be used in the fixed rate agreement or final settlement.

2. The Government's agreement with these rates is not an acceptance of the Colorado School of Mines' accounting systems, cost classifications, allocation methodologies or cost analysis studies.

FOR THE UNIVERSITY:

/s/

ART KIDWAY
Dean of Graduate Studies
and Research

11/18/94
Date

FOR THE GOVERNMENT:

Andrew D. Holland /s/

ANDREW D. HOLLAND
Contracting Officer

11/18/94
Date

For information concerning this agreement contact:
OFFICE OF NAVAL RESEARCH
ANDREW D. HOLLAND
INDIRECT COSTS/ONR 242
800 N. QUINCY STREET
ARLINGTON, VA 22217
PHONE: (703) 696-4842

22/22